SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

Accredited by NBA-AICTE and Accredited by NAAC – UGC with A+ Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 19EEO305 /Renewable Energy Generation Technology

IV YEAR / VII SEMESTER

UNIT 4- BIOMASS AND HYDRO ENERGY

Topic 1 – Biomass direct combustion

SUCCESSFUL STUDENT

Positive Attitude

Professionally Groomed

Socially Interactive

Technically Skillful

Solid fuels

Fossil fuels:

- Coal (moisture, volatiles, fixed carbon, ash) ($CH_{0.8}$)
- Coke (devolatilized coal or petroleum)

Biofuels:

- Wood (moisture, volatiles, fixed carbon, ash)
- Charcoal (devolatilized wood)
- Key difference among fuels: the quantity of CO_2 formed per unit of energy released. Natural gas releases ~ 42% less CO_2 than coal

Chemical equilibrium constant are calculated for following 6 equations. Eq. No.3 & 4 is called as Water Gas Reaction. Eq. No.5 is called Methane Formation Reaction. Eq. No.6 is called as Shift Reaction.

Chemical Equations	ΔH_0	ΔS_0	Equation No.
$C + O_2 = CO_2$	-94,200	2.06	1
$2C + O_2 = 2CO$	-53,300	45.54	2
$C + H_2O = CO + H_2$	+31,230	33.41	3
$C + 2H_2O = CO_2 + H_2$	+21,560	-7.89	4
$CO + 3H_2 = CH_4 + H_2O$	-49,300	6.51	5
CO+H2O = CO2+H2	-9,670	-10.07	6

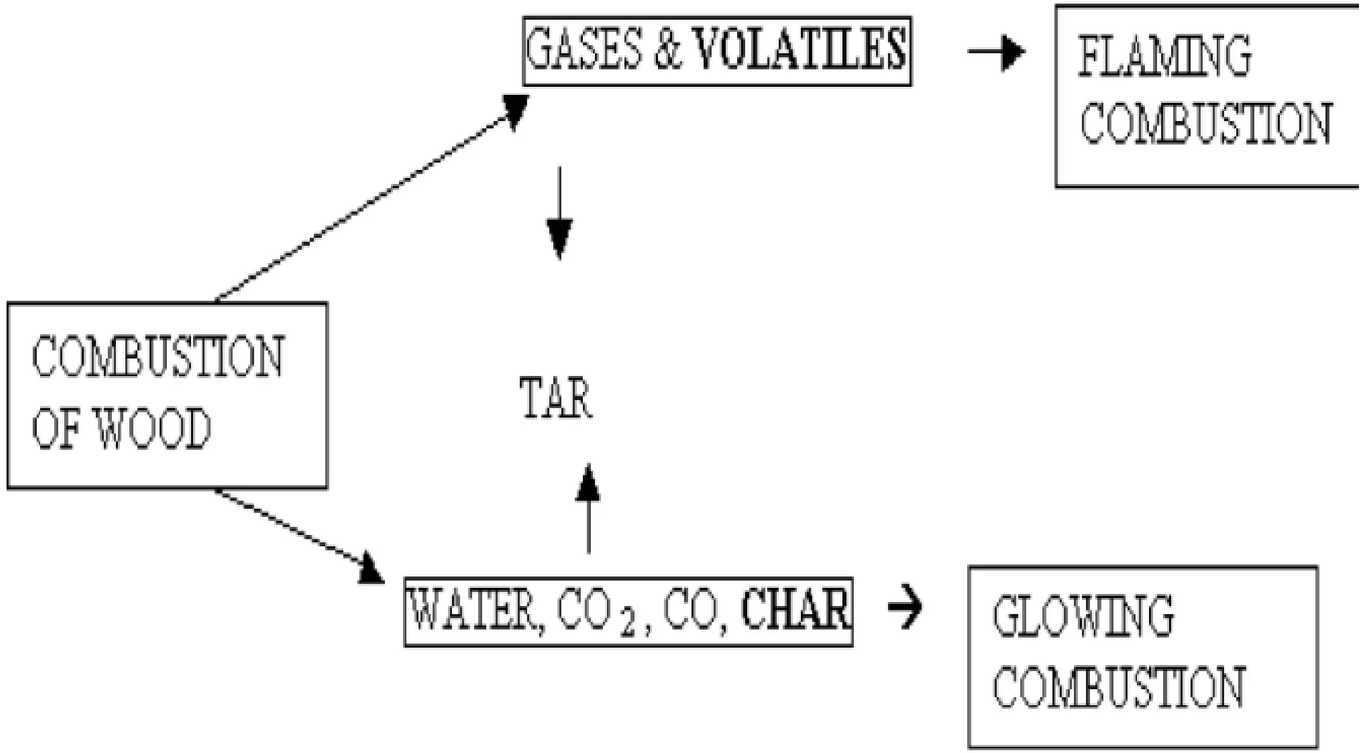
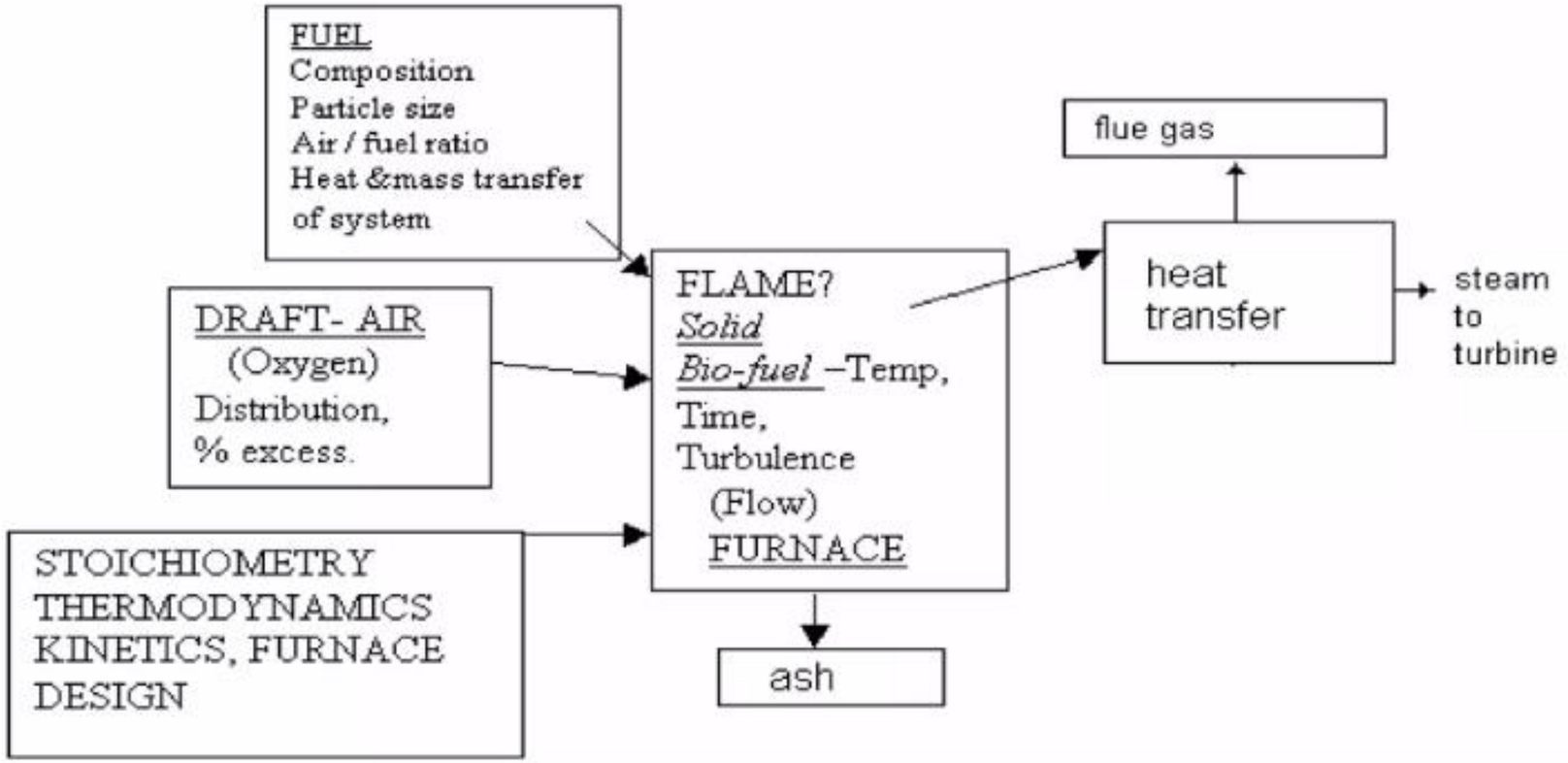


Fig: General pathways for pyrolysis and combustion of Wood

Combustion: A chemical process _ Oxidation of reduced forms of carbon and hydrogen by free radical processes. Chemical properties of the bio-fuels determine the higher heating value of the fuel and the pathways of combustion.

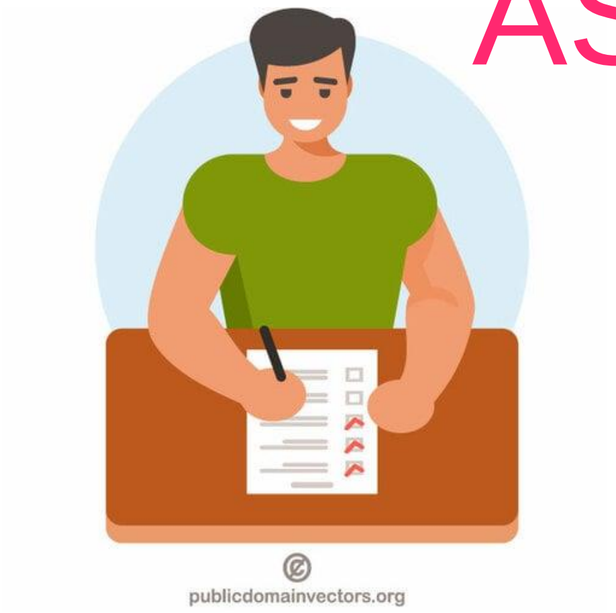


COMBUSTION OF BIOFUEL IN BOILER TO GENERATE STEAM

COMPARISON OF COAL AND WOOD AS FUEL FOR COMBUSTION:

COAL	WOOD
▪ Solid fuel, high ash content,	▪ Solid fuel, less ash, more volatile, reactive,
▪ used for Raising HP steam,	▪ used for Raising HP steam,
▪ Power production with Rankine cycle	▪ Power production with Rankine cycle,
▪ Gas Turbine cycles, Brayton cycle	▪ Gas Turbine cycles more difficult
▪ Can be used for producing process steam for direct heating	▪ Can be used for producing process steam for direct heating
▪ Large scale availability near mines and ports	▪ Assured availability is only on small scale— Variable
▪ Assured Technology for handling, storage and Processing well established	▪ Large scale processing. storage and energy conversion technology not established in India
▪ Sulfur content and ash content are problems	▪ Moisture content, low bulk density, Location specific availability are problems

ASSESSMENT



REFERENCE

Reference Book:

1. S.P. Sukhatme, ‘Solar Energy’, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997. (UNIT II)

2. G.N. Tiwari, ‘Solar Energy – Fundamentals Design, Modelling and applications’, Narosa Publishing House, New Delhi, 2002. (UNIT II)

3. S.M. Muyeen,” Wind Energy Conversion Systems: Technology and Trends”, Springer 2012. [UNIT III]

Text Book:

1. G.D. Rai, ‘Non Conventional Energy Sources’, Khanna Publishers, New Delhi, 2006. (UNIT I - V)

2. D.P.Kothari, K.C.Singal and Rakesh Ranjan,”Renewable energy sources and Emerging Technologies”, PHI Pvt. Ltd., 2009. (UNIT I-V)

THANK YOU!!